

Wei Ma

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EDUCATION

Ph.D. candidate, **Civil and Environmental Engineering**, Carnegie Mellon University
◊ Advisor: Prof. Sean Qian *Present*

M.S., **Machine Learning**, Carnegie Mellon University
◊ Advisor: Prof. George H. Chen *Present*

M.S., **Civil and Environmental Engineering**, Carnegie Mellon University *Dec. 2015*

B.S., **Civil Engineering**, Tsinghua University *Jul. 2014*
◊ Ranking top 10%, *Magna Cum Laude*

B.S., **Pure and Applied Mathematics**, Tsinghua University *Jul. 2014*

RESEARCH INTERESTS

- ◊ Dynamic network modeling (routing, simulation and optimization)
- ◊ Calibration of large scale dynamic traffic loading models
- ◊ Resilient management and robust control of transportation systems
- ◊ Large-scale data mining and machine learning

RESEARCH EXPERIENCE

Mobility Data Analytics Center, Carnegie Mellon University, Pittsburgh, USA
Research Assistant *Aug. 2014 - Present*

- Proposed and implemented an efficient data-driven framework to estimate travel demand profile using high resolution traffic count and speed data on Graphics Processing Unit (GPU)
- Developed the package “Mobility Data Analytics Center - Prediction, Optimization, and Simulation toolkit for Transportation Systems” (MAC-POSTS) for dynamic network modeling
 - ◊ Well organized, interface based C++ codes
- Finished the project “Dynamic network analysis & real-time traffic management for Philadelphia metropolitan area”
 - ◊ Developed a general regional network model to estimate/predict time-varying traffic evolution on all highways and major arterials
 - ◊ Assessed the dynamic traffic impact of road closures on freeways and/or major arterials
 - ◊ Proposed real-time traffic detour mechanisms to mitigate overall impact caused by closures
- Finished traffic impact analysis of the Greenfield Bridge closure project:
 - ◊ Cleaned and organized 10GB of traffic and GIS data; combined data from different sources
 - ◊ Recognized traffic demands (86k pairs) and travellers’ behaviors on a large road network
 - ◊ Predicted change of network conditions and traffic emissions after bridge closure

Singapore-MIT Alliance for Research and Technology (SMART), Future Mobility, Singapore

Summer Research Intern *Jul. 2013 – Sep. 2013*

- Designed and enhanced the convergence rate of a network calibration algorithm W-SPSA by 17%.
- Implemented the algorithm on Singapore’s network using real time data and improved model’s performance.

Institute of Transportation Engineering, Tsinghua University, China

Research Assistant *Jun. 2012 – Jun. 2013*

- Implemented and compared GLS, Kalman Filter and Stochastic Approximation for network tomography.
- Developed a Neural Network based data fusion method to fuse traffic data, improved the accuracy by 7.9%.

WORKING
EXPERIENCE

Balyasny Asset Management L.P., Chicago, USA

Financial Engineer Intern, Risk & Quantitative Developer

Jun. 2017 – Aug. 2017

- Discovered the cause of mid-term momentum using residual momentum and newly defined model momentum.
- Proposed and implemented the model to synchronize the risk of global market based on different market opening time, provided a better estimation of the covariance matrix and increased the Sharpe ratio by 0.6.

COURSE
PROJECTS

Streaming and Parallelized Coresets construction and its applications *Fall 2017*

- ◇ Proposed an asynchronized architecture for coresets construction to overcome the limitations of the conceptual framework.
- ◇ Implemented the proposed framework by Message Passing Interface (MPI) C++ and made it suitable for different coresets construction methods.

Estimating Low Dimensional Structure from Multivariate Data — From Filament to Ridge *Spring 2016*

- ◇ Explored different filament estimation methods and analyse their performance using noisy point clouds
- ◇ Discussed the ridge estimation for high dimensional data cloud with Gaussian noise

History-dependent adaptive SGD methods under asynchronized distributed setting *Spring 2015*

- ◇ Reformulated AdaGrad and AdaDelta to adapt asynchronized distributed setting and proved its convergence.
- ◇ Implemented the asynchronized distributed setting and SGD, AdaGrad, AdaDelta by Open-MPI.

Social circle recommendation System

Fall 2014

- ◇ Implemented and compared different clustering algorithms on grouping users' friends.
- ◇ Used lasso penalized logistic regression to help users set up groups for different friends; achieved 81.98% accuracy.

RcStudio – Online Reinforced Concrete Design System

Spring 2013

- ◇ Developed an artificial intelligence Q&A robot as a component of the system.

PUBLICATIONS AND
PREPRINTS

- [1] **Wei Ma**, Sean Qian, “Real-time traffic management through dynamic message signs: methodology and a case study for the I-95 Corridor in the Philadelphia Region”, working paper
- [2] **Wei Ma**, Sean Qian, “Estimating multi-year 24/7 origin-destination demand using high-granular multi-source traffic data ”, submitted to Transportation Research Part C
- [3] **Wei Ma**, Sean Qian, “A Generalized Single-level Formulation for Origin-Destination Estimation under Stochastic User Equilibrium”, Journal of the Transportation Research Board, accepted and forthcoming
- [4] **Wei Ma**, Sean Qian, “Statistical inference of probabilistic origin-destination demand using day-to-day traffic data”, , Transportation Research Part C, Vol.88, pp. 227-256
- [5] **Wei Ma**, Sean Qian, “On the Variance of Recurrent Traffic Flow for Statistical Traffic Assignment”, Transportation Research Part C, Vol.81, pp.57-82.
- [6] Ruimin Li, **Wei Ma** (2010) “Fusion method of road average-speed based on BP neural network and D-S evidence theory”, Journal of Traffic and Transportation Engineering, 14.005 (2014): 111-118 (in Chinese)

PRESENTATIONS

- [1] **Wei Ma** and Sean Qian. “A Generalized Single-level Formulation for Origin-Destination Estimation under Stochastic User Equilibrium”, invited to present in the Transportation Research Board (TRB) 97th Annual Meeting, 2018
- [2] **Wei Ma** and Sean Qian. “Statistical inference of probabilistic origin-destination demand using day-to-day traffic data”, invited to present in the Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting , 2017
- [3] **Wei Ma** and Sean Qian. “Statistical inference of probabilistic origin-destination demand using day-to-day traffic data”, invited to present in INFORMS Transportation and Logistics Society, First Triennial Conference, 2017
- [4] **Wei Ma**. “Travelers’ Behavior Modeling, Demand Estimation and Traffic Management: a Data Perspective”, invited to present in graduate seminar of Civil and Environmental Engineering, Carnegie Mellon University, 2017
- [5] **Wei Ma** and Sean Qian. “On the Variance of Recurrent Traffic Flow for Statistical Traffic Assignment”, invited to present in the Transportation Research Board (TRB) 96th Annual Meeting, 2017
- [6] **Wei Ma** and Sean Qian. “Statistical inference of probabilistic origin-destination demand using day-to-day traffic data”, invited to present in the Transportation Research Board (TRB) 96th Annual Meeting, 2017
- [7] **Wei Ma** and Sean Qian. “Mobility Data Analytics Center”, invited to present in Carnegie Mellon Traffic21/T-SET UTC Consortium Symposium and Research Showcase, 2016
- [8] Sean Qian, **Wei Ma** and Cong Ma. Dynamic network analysis and real-time traffic management for Philadelphia Metropolitan Area, presented in the Mid-Atlantic Section of the Institute of Transportation Engineers (MASITE) and the Intelligent Transportation Society of Pennsylvania (ITSPA) Annual Meeting, 2016
- [9] **Wei Ma** and Sean Qian. Generalized Statistical Traffic Assignment (GESTA), invited to present in the Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting , 2015

TECHNICAL REPORTS

- [1] **Wei Ma**, Pinchao Zhang and Sean Qian, (2016), Dynamic Network Analysis & Real-time Traffic Management for Philadelphia Metropolitan Area, for the Pennsylvania Department of Transportation (PennDOT)
- [2] **Wei Ma** and Sean Qian, (2015), Traffic impact of the Greenfield Bridge closure (AM peak), for the Department of Public Works, the City of Pittsburgh.

PROPOSALS

- [1] Reliability Data Guide – Procedures for Using Data in Travel Time Reliability Analyses. Federal Highway Administration Office of Operations Research and Development
- [2] Work Zone Safety Management through Dynamic Traffic Simulation

TEACHING EXPERIENCE

Teaching Assistant

- ◊ 94802-B, Geographic Information Systems, Department of Civil and Environmental Engineering & Heinz College, Carnegie Mellon University, 2017 Fall
- ◊ 10601, Introduction to Machine Learning, School of Computer Science, Carnegie Mellon University, 2017 Spring
- ◊ 12750, Infrastructure management, Department of Civil and Environmental Engineering, Carnegie Mellon University, 2017 Spring
- ◊ 12659, A1&A2, Special Topics: Matlab, Department of Civil and Environmental Engineering, Carnegie Mellon University, 2014/2015/2016 Fall

Student Supervision

- ◊ Cong (Max) Ma, undergraduate, School of Computer Science, CMU
- ◊ Zach Sussman, undergraduate, School of Computer Science, CMU

- ◊ Perry Cheng and Noel Lau, summer interns, undergraduates, Civil and Environmental Engineering, CMU
- ◊ James Crnkovich, undergraduate, Civil and Environmental Engineering, CMU
- ◊ Pengji Zhang, graduate student, Civil and Environmental Engineering, CMU

HONOURS AND AWARDS

Liang Ji-Dian Fellowship in Carnegie Mellon University, 2018
 Fenves Travel Grant in Carnegie Mellon University, 2016 & 2017
 College of Engineering Deans Fellowship in Carnegie Mellon University, 2015
 Outstanding Graduates of Tsinghua University, 2014
 First Class Comprehensive Scholarship of Tsinghua University, 2013
 Award for Outstanding Innovation in Civil Engineering Undergraduates in China, 2013
 Third Class Social Work Scholarship of Tsinghua University, 2013
 The Second Place of Challenge Cup Competition, Tsinghua University, 2012
 Second Place in 18th Structure Design Competition of Tsinghua University, 2012
 Second Class Comprehensive Scholarship of Tsinghua University, 2012 & 2011

MEMBERSHIP

Member, Institute for Operations Research and the Management Sciences (INFORMS)
 Member, Transportation Research Board (TRB)
 Member, Association of Tsinghua Alumni in Transportation (ATAT)
 Member, Chinese Overseas Transportation Association (COTA)
 Vice President of Student Association of Science and Technology(SAST), Tsinghua University, 2013
 Member of Committee for “Green City and Future Transportation” Conference, 2013
 Member of Lunch Awareness Project, 2012
 Member of Propaganda Department of the Youth League Committee, Tsinghua University, 2011

REFeree SERVICES

Referee, Networks and Spatial Economics
Referee, Transportmetrica A: Transport Science
Referee, COTA International Conference for Transportation Professionals

COURSEWORK

Mathematics: Real/Complex/Functional Analysis, Differential Equations(1), Advanced Probability Overview, Stochastic Calculus
Statistics: Multilevel/Hierarchical Models, Intermediate Statistics, Advanced Statistical Theory
Machine learning: Introduction to Machine Learning, Statistical Machine Learning, Machine Learning with Large Datasets, Deep Learning
Computer science: Introduction to Computer System, Great Theoretical Ideas in Computer Science, Algorithm Design and Analysis
Engineering: Engineering Mechanics, Structural Mechanics, Finite Element Analysis, Traffic Analysis and Design, Linear System

TECHNICAL SKILLS

Programming Languages: Python, C/C++, Java, MATLAB, R, SQL
Library & API: Networkx; MPI, Boost; Hadoop, PIG, Spark, TensorFlow, PyTorch
Tools: AWS, MySQL, Git, Vim, Bash, L^AT_EX, PostgreSQL
Language Competencies: Mandarin, English, Japanese